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# MOFFAT

(DUMFRIESSHIRE, SCOTLAND)

AND ITS

## MINERAL WATERS.

BY

WM. D'OYLY GRANGE, M.D.

WITH A SKETCH OF THE GEOLOGY OF  
THE DISTRICT BY D. J. BROWN.

MOFFAT:  
ROBERT KNIGHT, WELL STREET.

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MDCCCLXXXI.

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## P R E F A C E.

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 HERE is undoubtedly at present a growing inclination on the part of the public to hesitate before flying to the Continent in search of mineral waters, reputed to possess the power of curing the ailment from which they suffer, and to try if some of the mineral waters nearer home may not have an equally beneficial effect; and I hope that our consulting physicians, and members of the profession generally, may be induced not altogether to overlook the springs of Great Britain when studying the subject of mineral waters.

The want of a trustworthy source from which information may be gained by the public, and the medical profession at a distance, regarding one of the most charming of Scottish health resorts, together with the interest of the place itself, has induced me to undertake the task of compiling a brief, and, I hope, useful description of Moffat and its mineral waters.

There is, I believe, also a want felt by those who visit Moffat—many of whom are not acting under specific medical advice—of some work to which they may refer for direction as to how to proceed in taking the fullest

advantage of the benefits to be derived during their stay, and this want I hope to succeed in supplying to a considerable extent. There are few watering-places where one, if not more, of such works is not to be obtained, and now that Moffat is advancing into the first rank of British watering-places, it must not be behind them in this respect. I could have wished that the task had been undertaken by some pen more able to do it justice than I feel mine to be; but as such has not been the case, I have myself determined to undertake it, trusting that those who criticise will take into consideration the difficulties which the practice of a medical man imposes upon literary efforts.

Since I propose to furnish in this work information which will be of use and interest to members of the medical profession, as well as to the general reader, I have gone, in some instances, a little further into certain subjects, and treated them more technically, than I should have done had I been addressing the laity alone; but in doing so, I have endeavoured to arrange such matter in such a manner that it may not mystify the ordinary reader, who may pass by what he is evidently not intended to understand without diminishing his general interest in the book.

As the title of the book is divided, so is the subject-matter, regarding Moffat, not only as a place of residence whilst undergoing a course of the mineral waters, but

also as a place of residence for those who seek for such a locality, suitable to their health, comfort, and general convenience.

In writing of a watering-place which has many attractions common to similar resorts, and of mineral waters not entirely unique in their composition, it is impossible to altogether avoid reiterating much of what has undoubtedly been said long ago, and oft repeated, but which it is necessary to repeat here for the benefit of those who are not conversant with the general and particular literature of mineral waters, and the localities in which they exist. In fact, where I can find the words of another which will express what I wish to convey, I shall quote them at length, as having the force of being also the opinion of another and often abler authority. I do not propose to trespass to any extent upon the ground which belongs to the local guide books, the pleasure and information to be derived from reading which will not in the least be detracted from by a perusal of this book.

My doubts as to whether this book might in reality contain matter interesting to many, have been removed by Mr Brown's sketch of the geology of the district, which, though he has had to curtail, he has filled with interesting information, expressed in language at once simple and explicit—no easy task when writing upon the subject of geology.

There are many books furnishing interesting matter regarding Moffat. The earlier of these publications are, of course, difficult to obtain, and it is to the kindness of some of the older residents that I am indebted for having been able to make myself acquainted with their contents.

For a general description of the surrounding objects of interest, Black's Guide is very complete, having been corrected to the present year. A Guide, published by Mr Fairfoul, is also replete with interesting matter, particularly such as relates to the town itself. For a historical account of the district, "Moffat: Past and Present," by the late Mr John Brown, is certainly the best book, and the easy way in which it has been written adds greatly to the pleasure of reading it.

## INTRODUCTION.

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THE advance of civilization brings with it change more or less rapidly in the habits and surroundings of those who are under its influence, and though doubtless there is within our bodies a power to accommodate themselves to this change, it is not always sufficient to enable us to keep pace with the changes in our mode of living. One of the great sanitary problems of the day is to provide that the great aggregation of people in our large towns may not be attended with consequences prejudicial to the individuals of these communities. That it has not been quite successful, though wonderfully so considering the difficulties to be contended with, has led those who can afford it, to take advantage of the improved facilities for travelling, and thus to spend the major portion of the 24 hours in the comparatively pure air of a suburban residence. And it is yearly becoming more and more recognised that to spend even a small part of the year in the pure air of the country, is almost a necessity to the inhabitants of a town if they would maintain a high standard of health for any length of time.

With the increased spread of education there dawns the possibility of the advent of a day when even the working classes will regard the science of medicine, and particularly that branch of it called sanitary science, more in the light of a preventative of disease, than of a

conqueror of it. There are not those wanting in the profession who think that the day has already come when we may press home upon the public the advantage to be gained by employing the discoveries of medicine, more to guard them against the invasion of disease than they do at present, when too often they resort to their medical adviser only as a *dernier ressort*. But if the time for drawing the attention of the individual to the resources of preventative medicine has not yet come, the beneficial effect of their application to the communities at large has long been felt and acted upon.

One of the growing necessities to the busy man is that, for a portion of the year, or at any rate alternate year, he should enjoy a change of air and scene, and so, whilst he is recruiting corporeal energies, a corresponding repair may take place in his brain power. The prevalent mistake is in regarding a holiday and a change of surroundings in the light of a curative, rather than a preventative measure, and only employing it to repair a broken-down system, instead of by its means preventing a system from becoming the subject of premature decay. It were far better by an autumnal holiday among the mountains to prepare for a winter of work, attended not seldom by excesses in social amusements, than to have to recruit in spring in some warm climate of the South a constitution too much undermined to derive benefit from a bracing climate.

Of the resources of preventative medicine, change of air is one of the most important, especially is it so to those who reside in cities, and whatever advantages can be combined with change of air will enhance its value; but the very fact of its being a powerful remedial agent suggests, and with reason, that, if indiscriminately employed, it

may be as powerful to do harm as it is potent in doing good when prescribed with judgment and discretion. There is no doubt that even the children of perfectly healthy parents have a tendency, under certain circumstances, to develop strumous diseases. One conducing circumstance is that of being exposed for any length of time to the insanitary conditions so frequently met with in towns; and until these conditions can be entirely removed or greatly improved, almost the only preventative measure there is to fall back upon, is to arrange that they should pass a portion of the year in a place best tended to counteract the evil result of insanitary conditions already encountered or to be faced in the future.

The laws of climate are not sufficiently studied by those who fall back upon change of air as a prescription, with a result that a patient is often sent to a climate quite unsuited for his complaint. It has doubtless been the lot of every physician, in places where people resort to on account of failing health, to meet with cases of this sort, nor is a prematurely fatal result of such a mistake an uncommon occurrence. I do not wish to contribute to the very prevalent idea that the country is far more suitable as a place of permanent residence for all individuals in point of healthiness, for such I do not believe to be the case, nor must we attribute the beneficial results of change from town to country entirely to the inherent properties of the latter, for in many cases an equally beneficial change would be experienced were the change from one town to another, together with the addition of temporary immunity from the cares of business, and bustle of ordinary life. I cannot do better than quote at length from a paper read before the Manchester Statistical

Society, by Dr Noble, "On certain Popular Fallacies concerning the Production of Epidemic Diseases":—


"Indeed, it appears to me that under the circumstances in which mankind at large are placed, and with reference to human constitution generally, towns as such need not be less healthy than the country, and that, in point of fact, a well-selected dwelling in most of our great towns, as they actually exist, will, in an immense majority of instances, be found just as conducive to health and longevity as one that is strictly rural. I say in an immense majority of instances, because in a subject of this kind no rule that can be laid down will apply universally, the truth being that to some constitutions the country, and to others the town, is most advantageous. With large numbers, town or country makes no appreciable difference. . . . .

"Certain constitutions require, in an especial manner, that the inspired air should be pure, in order that the health may be sustained in fair ordinary measure. In such instances, a country residence will generally be found the best. This is most frequently the case in scrofulous habits of body, particularly if the temperament be phlegmatic. Young children almost always flourish more in the country than in towns, especially in summer. . . . .

"Now, on the other hand, there are persons so constituted that health depends much more upon moral and social influences than upon any extraordinary advantages affecting the respiration. Such individuals will often enjoy much better health in the town or immediate suburbs, than in the country—always supposing that some fair judgment has been exercised in the choice of a

dwelling-house. When the mind is active, and the disposition social, the dull and tame tranquillity of a country life, and its comparative loneliness, operate prejudicially upon the brain and nervous system through the mind, and thus health becomes deteriorated at its source—in the very springs of life. It is under circumstances of this kind that the invigorating effects of a temporary London life are often seen, if dissipation and excess do not antagonise them.”

So essential are the social surroundings spoken of by Dr Noble to a certain class of the community, that in selecting a country resort these must also be taken into account. It has for many years now been the fashion to fly to the Continent for even a short holiday, and to many the complete change and consequent excitement is doubtless both pleasing and beneficial. To others again they are most injurious, even though they seem at the time to stimulate into an improvement of health. To those whose lives are attended with a dull routine, requiring, perhaps, little of mental activity, and who, by absenting themselves at some distance from home, are not incurring any anxiety as to what may be the result of their absence, this form of recreation is decidedly suitable. In our large business towns, on the other hand, there are very many to whom the most suitable relaxation is complete quietness, particularly when obtained within easy reach of their place of business, and with good communication, so that they may be kept *au courant* with what is going on there. The South of Scotland is by no means fully appreciated by many people in England, who are unaware that there are hills or scenery worth visiting except in the Highlands, and often pass a



climate more temperate, and therefore more suited to them, in order to reach one where doubtless the scenery is grander, but where the cold is greater, and the expense of reaching which is almost double.

Moffat has the great advantage of being within reach of Glasgow, Edinburgh, and England, by, with few exceptions, all the express trains, so that it is possible to breakfast in London, and dine among the hills of Dumfriesshire, without making much alteration in the ordinary hour of either meal, whilst from Glasgow and Edinburgh it is only a matter of a couple of hours to reach this beautiful spot. Many people resident in the somewhat relaxing climate of the South of England and elsewhere, would derive quite as much benefit by a visit in summer to these easily-reached hills, as they do by journeying to the more distant Switzerland, or the Highlands, where perhaps the scenery is somewhat grander, but where the grandeur is, to some extent, diminished by the proportional size of the expenses—and though novelty is always attractive in scenery, it is not always so in food.

## MOFFAT AND ITS MINERAL WATERS.

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### MEDICAL HISTORY.



THOSE learned in such matters state with confidence that the situation of Moffat found favour in the eyes of the early Britons, and as the Well can hardly have had attractions to their primitive palates, doubtless it was the sheltered position and dry character of the soil which drew them to the spot.

It is not until the beginning of the seventeenth century that we glean any information interesting from a medical point of view. About that time we learn that the therapeutic properties of the Well were discovered, and brought prominently before the public shortly after. In these days, when ladies are reminding us of their rights in medical as well as other matters, it would be an injustice to pass by the fact that the discovery was made by a member of the fair sex—Miss Rachel Whyteford, daughter of the Rev. Walter Whyteford, afterwards Bishop of Brechin, who had visited some of the Spas of England, and was so prepared to appreciate the fact that a water not at once pleasant to the taste might nevertheless be virtuous as a medicine. Some will be glad to learn that the medical knowledge of Miss Whyteford did not unfit her for household duties, at least so thought Mr James Johnstone of Corehead and Loch House, who some time afterwards made her his wife.

The exact date of the discovery of the Well, or perhaps more accurately speaking of the medicinal properties,

is somewhat difficult to fix. M'Kail, writing in 1639, says that as he was credibly informed the discovery had been made six years previously by a valetudinary rustic on his way to the Brampton Wells, so fixing the date at 1633. Most subsequent writers agree in thinking that M'Kail was misinformed as to the real discoverer of the Well; but though they do not agree with him as to the discoverer, they have accepted, perhaps for lack of a better, the date of 1633 which he gives. In a letter of the late Mr Charles Stewart of Hillside, which Mr S. M'Millan kindly put into my hands, I find that the discovery is attributed to Miss Whyteford before her marriage to Mr Johnstone. Now, the marriage contract, which I have also seen, is dated 1627, so that, as Mr Stewart says, the discovery must have been prior to this date, which brings us at anyrate close upon the first quarter of the seventeenth century.

In 1639, as before mentioned, we find the properties of the water engaging the attention of a worthy member of the profession, Dr Matthew M'Kail, who in that year recorded his observations and theories regarding it in a small work, written in Latin, entitled "*Fons Moffetensis*," which work in 1664 he enlarged and translated into English. This work is, of course, exceedingly interesting, though it contains little information of practical utility; it is worth noting, however, that he thought it advisable to offer an elaborate apology for translating it into English for the benefit of those "who were desirous to understand those mysteries of ART and NATURE which were wrapped up (as they conceived) in an inexplicable idiom of a foreign language."

In 1683 Sir Robert Sibbald describes the Sulphur Well in his "*Nuncius Scoto-Britannia*."

In 1745 Dr Carlyle, of Musselburgh, mentions the liveliness of Moffat that year, which he attributes in part to the patronage of Dr Clark and Dr Sinclair, Edinburgh physicians.

In 1748 an additional attraction was added to Moffat by the discovery of the Hartfell Spa by Mr John William-

son, a clever though somewhat eccentric man. The water is a chalybeate, of which there are several in the neighbourhood, more or less potent. This, however, is the one best known and the only one used.

In 1800 Dr Garnet, Lecturer on Natural Philosophy and Chemistry in the Andersonian University, and afterwards Professor in the Royal Institution of Great Britain, published a tract, entitled "Observations on Moffat and its Mineral Waters," which tract originally formed a part of his "Tour in Scotland." A second edition of this appeared in 1820, enlarged and with notes by his friend William Dickson, LL.D.

Dr Garnet quotes largely a Dr Johnstone, whom he speaks of as "a judicious physician who has practised at Moffat more than thirty years." This work doubtless had the effect of bringing the Moffat waters under the notice of the profession, and a steady increase of the visitors each year has been the result. Since the publication of this work there has been much written about Moffat, but no work by a medical man with special regard to the waters, which fact has induced me to publish this account of them.

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## THE TOWN OF MOFFAT.

THE little town of Moffat nestles among the hills of the extreme north of Dumfriesshire, where they converge to form the upper boundaries of fair Annandale. It is sheltered on the north, the east, and west, by hills varying in height from 800 feet to 2651 feet; towards the south it lies open with a view extending to the hills of Cumberland—the town itself 347 feet above the level of the sea. It is distant two miles from Beattock Station on the Caledonian Railway, from which it is almost completely hidden by a line of hills. The nearest towns on the north, east, and west, are Biggar, Peebles, Selkirk, and Hawick, from all of which it is shut

off by high mountains and pastoral desolation. Southwards, the first town we come to is Lockerbie, 16 miles, so that Moffat well may be termed a secluded spot. Nor can its seclusion be disturbed by the proposed railway branch into it from the Caledonian Railway, as through traffic is an impossibility, and never is it likely to become the scene of manufacturing industries. From Edinburgh, it is distant 60 miles; from Glasgow, 65 miles; and from Carlisle, 40 miles. At Beattock Station, however, nearly all the express trains from both north and south stop, which makes the communication with the centres of population equal to any and superior to most places of similar character. The postal authorities have taken full advantage of the convenient arrangements of the railway, and letters posted in Edinburgh or Glasgow are delivered in the afternoon, thus permitting an answer to be despatched by the evening post of the same day. The town is built upon the slopes of the Gallow Hill, 832 feet, as they extend down to the River Annan, which latter rises some five miles distant in a hollow among the mountains called the "Devil's Beef 'Tub,"—the same mountain giving birth on its other side to the Tweed and Clyde. The soil is most suitable for healthy residence, as will be seen from a report which Mr D. Brown, a geologist, who has studied the district, has kindly favoured me with, and which, being too full of interest to be curtailed, I have given at length. The houses are chiefly built of the greywacké, so abundant in the neighbourhood, and commonly known by the name of whinstone. In many cases they are faced with the red sandstone, taken from a quarry further down the Vale of the Annan. Many of the houses are very large and commodious, and in most instances have been built for the special purpose of letting, either as a whole, or in apartments to visitors. The population of the town, as shown by the recent census, is 2926, consisting of 1293 males, and 1633 females. There has been an increase of 427 persons since 1871.

But the size of the town is by no means in proportion

to these somewhat small numbers, as it is built to accommodate quite twice the number, which capacity is sometimes taxed to its full extent during the height of the season; and of necessity shopping facilities are provided for upon the same scale, in which respect it will compare favourably with some even of our largest towns. There is hotel accommodation, which will be found most comfortable, and there is one of the largest and best-managed of the numerous Hydropathic Establishments which have of late sprung up so numerous in Scotland, but few of which can, I think, boast of as much patronage as has been accorded to it—a tribute not only to its management but also to the charms of its situation.

The climate of Moffat is, of course, not perfect, nor does it perhaps differ very greatly from many places similarly situated and having the same characteristics. That the rainfall is equal to many other situations and exceeds that of some, is only to be expected from its proximity to the hills and its southern exposure. The rain, however, generally falls in earnest when it does fall, and even in showery weather walking is made possible and even agreeable by the gravelly nature of the soil. The temperature throughout the year is wonderfully equable, excessive heat in summer being tempered by the mountain breezes, and the cold of winter being greatly mitigated by the shelter obtained from the surrounding mountains on the north and east.

In winter, the weather, when compared with what is often experienced at the same time in other parts of Scotland, certainly cannot be complained of, and often may be regarded with satisfaction. In spring-time some delightful weather is often dealt to us, and it is much enjoyed by those who have spent the winter amid the smoke and fog of a city life. Of course it is unreasonable to expect, as some do, that whilst rain is the order of the day everywhere else, that the spot which they have chosen for a few days' holiday should be entirely exempt from the general deluge. The climate of Moffat may be char-

acterised as a bracing climate at all seasons of the year, even in summer, and especially so in autumn.\*

This bracing character, which makes it so suitable to many people, is certainly a reason for warning off those who, on the other hand, seek a sedative rather than an exciting climate. There are, without doubt, certain nervous complaints and some pulmonary diseases which are more likely to be aggravated by such a climate than improved, and which would be more likely to derive benefit from a sea-side resort or relaxing climate of the South. One of the general effects of the purity of the air is to increase the inclination for sleep, and it is perhaps as well, at first, at any rate, to add an hour or two to the period usually allotted for this purpose, which, however, must be done by retiring to rest at an early hour, and not by acting upon this advice in the mornings. It is, however, not unusual to meet with people, particularly elderly people, upon whom the exciting properties of the air act in such a manner as to render them sleepless at first, though after one or two nights this is generally replaced by the more ordinary effect. Sometimes it is desirable to procure a good night's rest at first by artificial means.

The climate is particularly one suited to people recovering from debilitating illness, and to those who require the tonic effects of mountain air. It is antagonistic to the effects of a relaxing climate, and those who have not received the bracing effects they may have expected from sea air, will often find it here, and for this reason it is often resorted to for a few weeks before returning home by those who have spent a part of the summer at the sea-side. To residents in the South of England, it offers an easily-reached and bracing

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\* The air of Moffat is reputed to contain a large proportion of Ozone. I do not, however, look upon our knowledge of its specific properties as a therapeutic agent, or of the accuracy in the methods of detecting its presence, as sufficiently great to warrant my wandering into any speculation as to the benefits which may be expected from its presence. Dr Garnet observes that the super-oxygenation of the air causes some people who are not accustomed to it to sneeze at first.

atmosphere, with all the novelty and attractiveness of living among mountains. It is a climate pre-eminently suited to children who ordinarily live in towns, and it has often proved a refuge to elderly people who place the enjoyment of health before all other pleasures. No rule can be laid down for asthmatic people, as, like other places, it proves suitable to some, but unsuited to others. Where there is bronchitis combined with asthma, benefit is derived from the sulphur waters. Very much misconception exists in the minds of many regarding the climate of Moffat during the winter. It is a most suitable place for residence during the winter months, on account of the dry character of the soil, and its sheltered position. Some people even live in Moffat during the winter, and in summer let their houses for one or more months, while they themselves go elsewhere, perhaps to the sea-side, and return again in winter.

It may at first seem imaginary to detect any difference between the climate of one and another part of so small a town; but it must be remembered that the town is not compact, and that it stretches round the corners of hills, and creeps up valleys. Those who have resided in different parts of the town will, I think, bear me out as to the fact of there being an appreciable difference in various situations. Beechgrove, being a continuation of the Main Street, stretches up the valley of the Annan, which here becomes much narrower. It creeps under the shelter which the Gallow Hill affords from the east, and so has the reputation of being warmer and milder, though it is perhaps not quite so dry as the more exposed parts, and certainly is not built upon the same depth of gravel which is found on the other side of the hill. The Well Road, on the other hand, stretches along the other side of this hill, and is so more exposed towards the south-east. It is certainly the more bracing part of the town, though perhaps colder, and being more in the open country, has the advantage of more extensive view.

The Hydropathic Establishment, whilst retaining the

shelter of the Gallow Hill, has also an extensive view from its high position.

It will at first appear as if Beechgrove was much farther from the Well than the rest of the town. This, however, is not so, at least for the pedestrian, who, by a road at the back of the town, is quite as near the Well as the rest of the town.

An excellent supply of spring water was introduced to the town in 1867. The water is obtained from springs on the estate of Granton, four miles distant from the town. The following was the report by Dr Stevenson Macadam, when it was proposed to utilise this supply:—

#### WATER SUPPLY OF MOFFAT.

The water introduced into Moffat by the Police Commissioners last autumn, from the springs at Granton, 150 feet above the High Street, gives a supply of 12,000 gallons an hour of excellent quality and great purity, as shown by the annexed analysis made for the Commissioners before acquiring the springs.

#### ANALYTICAL LABORATORY, SURGEONS' HALL, EDINBURGH.

I have carefully tested a sample of water received from the Commissioners of the Town of Moffat, through Alexander Ramsay, Esq., manager of the Edinburgh Water Company.

The water is clear, transparent, and colourless, and possesses an agreeable taste. It contains 3·72 grains of Saline and Organic matter in the Imperial gallon, of which 3·34 grains are Saline and ·38 grains Organic matter.

The hardness is only 2°, and accordingly it ranks as a soft water. It contains no metallic or other impurities, and can be safely conveyed through lead pipes. I am of opinion that the water under examination is of first-class quality for culinary purposes and for washing operations, and that it is eminently suited for introduction into a town for general domestic use.

STEVENSON MACADAM,  
*Ph.D., F.R.S.E., Lecturer on Chemistry.*

Next in importance to a good supply of water, if indeed not prior to it, is a satisfactory system of drainage, and this also was introduced to every part of the town in the same year, with the result, as I have ascertained by a careful analysis of the mortality statistics of the last twenty-five years, which is extremely satisfactory. The death-rate from zymotic diseases has been very greatly reduced, there having been only one death from typhoid fever recorded in the last twelve years, and in no year since has zymotic disease been epidemic.

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“THE WELL.”

“THE Well,” as the sulphurous springs are termed, is situated about a mile and a-half from the centre of the town, 624 feet above the sea, 277 feet above the High Street, upon the side of the Birnock Cloves Hill. It springs from the rocks on the verge of a dell through which flows a burn originally called the Birnock, or “Little Water,” but which is now more generally known as the Well Burn, from its proximity to the springs, which, previously to their being intercepted for drinking purposes, found their way into it. There are two springs, the upper and lower. The latter being stronger in the sulphur element, is the one employed for drinking, and the water of both is conducted to the town for the purpose of baths. There is a verandah built over the Well for the purpose of affording shelter to those who frequent the water, and the spot is exceedingly picturesque in itself, and commands an extensive and charming view. The Well is arrived at from the town by an excellent carriage road. The ascent being distributed over the whole of it, is not much felt by even a poor pedestrian. The water of the Well has been analysed over and over again since the time of M’Kail. A perfectly accurate analysis of a mineral water is difficult, if not impossible, to attain; but for all practical purposes no very exhaustive

process is required. I append an analysis by Mr Wm. Johnstone, which, being couched in the terms of the chemistry of the day, is perhaps the one most suitable:—

|  |          |              |
|--|----------|--------------|
| Specific gravity at                              | 60° F.   | 1001·068     |
| Temperature                                      | 49·5° F. |              |
| Temperature of air                               | 64·0° F. |              |
| Sodium chloride . . . . .                        |          | 0·8524       |
| Sodium sulphhydrate . . . . .                    |          | 0·0078       |
| Calcium chloride . . . . .                       |          | 0·1243       |
| Calcium sulphate . . . . .                       |          | 0·0125       |
| Calcium carbonate . . . . .                      |          | 0·0940       |
| Magnesian chloride . . . . .                     |          | 0·0581       |
| Magnesian carbonate . . . . .                    |          | 0·0402       |
| Potassic chloride . . . . .                      |          | 0·0616       |
| Ferrous carbonate . . . . .                      |          | 0·0247       |
| Silica . . . . .                                 |          | 0·0180       |
|  |          | <hr/>        |
|  |          | 1·2936       |
|  |          | <hr/>        |
| Total residue in one litre dried at 356° F.      |          | 1·3874       |
| Volatile and organic matter . . . . .            |          | 0·1150       |
|  |          | <hr/>        |
| Total solid residue in one litre                 |          | 1·5024       |
|  |          | <hr/>        |
| Iodine, manganese, and lithia, in minute traces. |          |              |
| Gases dissolved in one litre . . . . .           |          | 34·508 c. c. |
|  |          | <hr/>        |
| Hydrogen sulphide . . . . .                      |          | 5·325        |
| Nitrogen . . . . .                               |          | 25·644       |
| Carbonic dioxide . . . . .                       |          | 2·539        |
| Oxygen . . . . .                                 |          | 0·999        |
|  |          | <hr/>        |
|  |          | 34·507       |
|  |          | <hr/>        |

The water belongs to the class of waters generally termed sulphureous, and owes its principal action to the sulphur contained therein, chiefly in the diffusive and effective form of hydrogen sulphide; but in summing up its effects, we must not fail to take notice of the action of

the water itself, and of the saline and other constituents, which not only have an action of their own, but also act in a modifying manner.

As might have been expected from our knowledge of the specific action which sulphur exercises upon the cutaneous functions, it is in affections of the skin where we find some of the best results.\* Next to diseases of the skin, perhaps its most important action is upon the glandular system, particularly in the case of children suffering from enlarged glands as a sequel to measles or scarlet fever, or arising from strumous diseases, whether hereditary or acquired. It is also useful in strumous affections of the bones. In rheumatism and gout it has long had a reputation, acting in the latter best as a prophylactic, and in the former in removing what may be termed results, as stiffness of the joints and rheumatic neuralgia. The waters may also be employed with benefit in chronic affections of the liver and kidneys, in the removal of abdominal plethora, &c,† and in chronic bronchitis it has been found of use, particularly when there is copious expectoration.‡ The beneficial action of the sulphur and sulphides resulting from its decomposition, renders the water efficacious in the treatment of chronic inflammation of the throat.§

The water is a cold water, being of pretty constant temperature 49° all the year round; it is beautifully clear, and when freshly drawn, sparkles from the evolution of the gases contained in it. The smell has been likened to many things, some of them not pleasantly suggestive;

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\* Pityriasis, Psoriasis, Prurigo, Sycosis, and Acne, are generally benefited by these waters. In secondary specific affections, the reverse is, however, the case, as they are aggravated, though it has been suggested that they may therefore be brought under their action.

† Through diuresis, and the increased metamorphosis of tissue which they favour.

‡ The result of the direct action of the sulphur, which is eliminated from the lungs.

§ Of the tonsils, uvula, eustachian tube, and meatus auditorius.

perhaps the best is that of the smell of a hard-boiled egg. There is also a decided saline taste, which becomes more perceptible after the drinker has become accustomed to the sulphureous taste. To many people the taste of the water is at first disagreeable, but this dislike is generally easily overcome, and is in very many cases replaced by a decided liking for the water. Those who really cannot overcome their dislike to the water, if they find it so great as to preclude them from taking it, may add a few drops of tincture of ginger, or compound tincture of cardamoms; these should, however, never be resorted to if it is possible to do without them.

The numerous bubbles on the side of and rising to the top of a glass of the water when freshly drawn, are chiefly composed of sulphuretted hydrogen, which is never very firmly bound to the water, and which, if the water be left for any length of time exposed to the air, entirely escapes, leaving the water nearly tasteless.\*

Sulphuretted hydrogen is freely excreted by the skin, and blackens silver in the pockets, and ornaments made of it when worn about the person of those drinking the waters. These waters do not, as a rule, exercise much aperient effect, and when they do, it is more due to the quantity of water taken, than to the action of its constituents.†

I would lay some stress upon this absence of an aperient action, as a rule, in these waters, as it is a point upon which there is very considerable misconception. I have even heard it remarked that the Moffat waters were of no use, as they had not this action to any marked extent; only showing how vague is the notion regarding their properties entertained by many, who, however, employ

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\* This gas decomposes into sulphur and hydrogen, the latter joining the oxygen of the air, and the former being precipitated, may be detected on the sides of the Well.

† The stimulant action of sulphureous waters, both internally and externally, is increased by the presence of iron, and decreased by the presence of aperient salts (Sir R. Christison). So that it is to the absence of an aperient effect we owe many of the valuable properties of this water.

them without any definite idea as to what result may be expected. It is in this absence of an aperient effect in most cases that one of the chief virtues of the water lies, as it thus exercises a more stimulant action upon the skin, kidneys, and liver. In some people the water even causes slight constipation. For these and other cases in which it is desirable to administer an aperient, the most suitable method is to add to a tumbler of the water a teaspoonful of Rochelle salts, or other salts selected and compounded for the special purpose. Like nearly all mineral waters, these are applicable only in diseases which from their outset have been of a chronic nature, or which, having passed through an acute stage, have become chronic. In no case are they advisable in acute diseases, at any rate without constant medical supervision. If any real benefit is to be expected time must be given them to work the desired change; few cases will receive any marked benefit by drinking the waters for only a week. Doubtless a week's use of them may work wonders in a person only suffering from the result of excessive indulgence in stimulants, particularly if the injurious excesses have been at the same time forsworn; but in diseases of long standing a longer trial must be given them, at any rate before passing an adverse opinion regarding their efficacy.

Sometimes slight exacerbation of symptoms is the early result of drinking the waters, with perhaps the addition of slight feverishness. If, however, the case is a suitable one for being treated by their use, these retrograde symptoms pass off, and are replaced by a slow but steady improvement. All the older writers warn off consumptive patients from the Moffat Well, and perhaps it was safe that they should do so, particularly when there was not much discrimination exercised between the various forms of this class of diseases; and certainly even now no person with consumption should drink the waters except under medical advice. Delicate women should also be careful how they follow the fashion of the place upon their own responsibility, as the result will often be injuri-

ous to themselves and a discredit to the Well, at least in their eyes.\* It is not an uncommon thing to see people for whom the water can have certainly no good effects in store, following out a prolonged course of it with more patience and perseverance than discretion. For the benefit of many who, without having anything the matter with them, nevertheless like a morning visit to the Well and a tumbler of the water, I may state that there is little or no chance of them receiving anything but benefit from such indulgence, and the better the health they are in the more this holds good. In skin diseases, and even rheumatic affections, local treatment must by no means be neglected; particularly is this the case in skin disease affecting the head.† Among local applications I must mention here the local application of the sulphur water, which will, however, be more fully considered under the head of "The Sulphur Bath."

The water, in common with most mineral waters, acts best upon the system when taken early in the morning, when fasting, and at its source, accompanied by a judicious amount of exercise. The distance from the town renders the fulfilment of all these conditions difficult to many, hurtful to some, and impossible to a few. The difficulty of distance is, however, considerably overcome by the capital omnibuses, with accommodation both outside and inside, which leave the town at 7 A.M. during all the summer months. The opportunity of thus driving there and back should be taken advantage of by all who are not strong enough to undertake the walk both ways without incurring fatigue. A very suitable arrangement is to drive to the Well and walk home, or even part of the way

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\* Anæmia cases, as a rule, are not calculated to receive much benefit from the Well water, and should rather be advised the Hartfell (chalybeate) water.

† I have seen people suffering from eczema capitis who expected a rapid cure when even no attempt had been made to remove scabs, &c., which must have been of weeks' and months' formation. The local applications should be as simple as possible, and prescribed with regard to the character of the water.

home if it be only half-a-mile to begin with. By driving up and walking home many advantages are gained. Firstly, the invalid does not incur the risk of drinking the water whilst being heated, as is apt to be the case after walking up the hill. Secondly, it permits of as much time being taken in drinking the water as it may be wished to take; and thirdly, the gentle exercise of a walk down the gradual descent upon a good road considerably assists the action of the water especially upon the skin, and the time which should always elapse between drinking the water and sitting down to breakfast is thus pleasantly filled up. In some cases a return to the Well in the afternoon or evening is advisable, particularly when only a short stay in Moffat is contemplated.

That the time-honoured custom of an early visit to the Well is quite unsuited for many people cannot be denied, though it is difficult for some people to see that early rising can do any harm, nor does it perhaps when made a habit of, but in the case of those who have never been accustomed to it and all at once begin to practice it, the consequences are such as are not likely to add to the pleasures of a holiday; it is not so much the early rising which causes the feeling of *ennui* for the rest of the day, as the exercise in the fresh air before breakfast. Men will seldom be anything but benefited by early rising and moderate exercise before breakfast, but women are often rendered quite incapable of doing or enjoying anything for the rest of the day if they have any tendency to being delicate; elderly people seem generally to stand it better, and children, if sent to bed early enough, are almost always benefited by it. Some people are in the habit of eating a biscuit before leaving home, which is perhaps permissible, particularly when it is intended to walk both ways; if, however, it can be dispensed with, so much the better. The habit of taking a cup of tea the first thing in the morning, particularly in young people, cannot be too strongly condemned, and the benefit experienced from it is only an argument against it. At no time is the nervous system so susceptible to stimulation

as early in the morning, and therefore at no time is the resort to artificial stimulation more likely to be attended with ultimate injury. As a general rule, the early visit to the Well is most likely to be attended with the best results. When, however, it is not expedient, the water may with benefit be taken at some other hour, never, however, shortly after a meal. A comparatively early breakfast and a walk up to the Well about 12 o'clock will be best suited to those who do not go in the early morning, and a visit to the Well in the evening is suitable if dinner has been partaken of in the middle of the day; or in the afternoon if the dinner hour is a late one. Though the water is apt to lose a portion of its gaseous elements when not freshly drawn from the source, it nevertheless retains sufficient of them for several hours, when kept in properly corked bottles, to permit of its being of much benefit when brought to the town for those who cannot visit the Well; it may also be thus used for a second draught by those who make only one visit to the Well. The subject of diet should engage the attention of those drinking the water with a view to receiving benefit; it is, however, difficult to lay down any rules upon this somewhat extensive subject, which will apply to even a large number of cases and various idiosyncracies. Breakfast should, in the country, always be at an early hour; more particularly is this the case when the dinner hour is an early one. The meal which directly follows the drinking of the water should in all cases be an easily digested one, and should not include green vegetables of any kind. Milk and eggs, of which the supply is always abundant and good, should be largely called into requisition in making the dishes of the invalid; seasoned dishes are generally to be avoided, and stimulants are better omitted, except in cases of great debility—if resorted to, the evening is the time of day to which they are most suited. A mid-day dinner is very suitable to those who have visited the Well in the morning, and many who, though not accustomed to dining at an early hour at home, fall readily into this arrangement after rising betimes

and partaking of a light breakfast. Some people cannot alter the hour of this meal to which they have been accustomed, and find that by retaining the habit of dining late they enjoy better health. Those who dine early, in addition to tea in the afternoon, generally require supper, which, however, should not be a heavy meal, and should be partaken of at least an hour before bed-time; to many, a glass of milk with a biscuit is sufficient. In regard to the drinking of milk, which, when the facilities for obtaining it pure are so great, should occupy a prominent place in the dietary of children, it should be borne in mind that as milk is a food it should not be swallowed in a hurry; if five or ten minutes be spent over a tumbler of milk, and particularly if each mouthful is retained in the mouth for a few seconds before swallowing it, it will seldom be found to produce any of the feelings of discomfort or symptoms of indigestion often experienced by those who drink it as an ordinary beverage. Smoking in the mornings should in all cases be avoided, not only by the invalid, but also by all who value the health they enjoy; there is a tendency in all who indulge in this habit to exceed the ordinary amount of their indulgence during the idle hours of a holiday, the stimulating effects of the country air causing the desire for the sedative effects of tobacco. It is this exciting property of pure country air which permits many to resort more frequently to the pipe or cigar than they could do at home, and though they do so without apparent harm they are no doubt counteracting the benefit they otherwise would obtain.

To be out of doors as much as possible should be the object of all, and as much exercise as can be undertaken without excessive fatigue should daily be taken. Too much exercise is to be avoided at first, as it often results in none being possible afterwards. By beginning with little, and gradually increasing, even those who are unaccustomed to it at home will be astonished at the length of the walks they are able to take after a few days.

## HARTFELL SPA.

THE discovery of the Hartfell Spa supplied a water particularly suited to those cases which are not likely to receive any benefit from the Moffat Well, but to which the climate is admirably suited—namely, cases of anæmia, or poverty of blood, particularly in the element of iron. The water is a chalybeate, not very strong, but I think quite strong enough. The source of the water is at a distance of four miles from the town, and the road to it is a difficult one, so that it has to be brought into the town. Fortunately, it does not lose any of its character in transmission, and may be taken with quite as much benefit the day after it has been brought into the town as at the source itself. If bottled with the view of keeping any length of time, it is advisable to add a few drops of sulphuric acid, in order that all the iron may be kept in suspension, and this is generally done. The analysis I give here gives a clear idea of its composition:—

|                                    |     |     |     | In one Imperial Gallon. |
|------------------------------------|-----|-----|-----|-------------------------|
| Ferrous Sulphate,                  | ... | ... | ... | 5.96                    |
| Aluminic Sulphate,                 | ... | ... | ... | 6.43                    |
| Calcium Sulphate,                  | ... | ... | ... | 4.03                    |
| Magnesian Sulphate,                | ... | ... | ... | 4.72                    |
| Silicic Acid, ...                  | ... | ... | ... | 1.87                    |
| Soda, with Silicic Acid, and loss, | ... | ... | ... | 1.05                    |
| Sulphuric Acid, free,              | ... | ... | ... | traces                  |
| Total, ... ..                      |     |     |     | 24.06 grains            |

The water may be drunk undiluted, and may be taken at meal time, or at almost any hour of the day, the after-part of the day being perhaps the most suitable, as iron sometimes tends to give a headache when taken in the morning. The quantity of the water which should be taken may perhaps be stated at about a quart per diem. The water is especially suited to all cases of anæmia

where there is no feverishness.\* Delicate women receive benefit from these waters. I am in hopes that, from the character of the surrounding hills, a chalybeate of equal virtue may, before long, be found nearer to the town. There is a slight tendency in this water to cause some degree of constipation.

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## THE BATHS.

A CONSPICUOUS and handsome building was erected in 1827, on the west side of the High Street, containing an Assembly Hall, Baths, and Billiard-Room. The water from the Sulphur Wells is brought in pipes to this building, so that baths of the mineral water, at any temperature, may be had, in addition to various kinds of baths of ordinary or medicated water. I cannot offer any description of these baths, as they are at present undergoing extensive alterations and additions, in order that they may not be inferior to those constructed upon the many improvements resulting from the amount of attention given to the subject of balneology in recent years. I am almost afraid to venture upon the subject of bathing, which has received so much attention from medical men of late, and even converted into a speciality by some; but something I must say upon the subject, particularly that part of it which belongs especially to bathing in mineral waters.

If it was desirable to offer a warning against indiscriminate use of the mineral waters internally, so it is well to suggest, at least, discretion in employing them in the form of baths, and more particularly as hot baths.

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\* Professor Laycock used to lay great stress upon the danger of administering iron in any shape where there is Hyperpyrexia, and I have certainly seen cases of consumption where harm was done by drinking this water, the result being pulmonary hæmorrhage.

The sulphur baths will be found of great service in the treatment of a tolerably large class of diseases of the same character as those in which the internal use of the water has been recommended. In considering the class of cases to which they are applicable, we must regard their direct action upon the skin, their constitutional effects due to the ingredients, and the temperature of the water. Whatever may be the absorbent power of the skin, I think there is little doubt that it is capable of absorbing sulphur during immersion in hot sulphurous baths. No doubt a certain portion of the sulphurous element of the water is lost in transmission to the town, and still more during the heating of the waters; but there remains a portion both of the volatile part of this element and that part of it which exists in combination salts.

The choice between cold, temperate, and hot baths will depend upon the time of year, the constitution of the bather, and the nature of the disease.

The principal action of a cold bath is the extraction of heat from the body; and the varying degrees in which it is thus employed makes the difference between its action as a tonic, an excitant, or a depressant, or its difference in acting prejudicially or beneficially. The great secret in cold bathing is to know the proper time to leave the bath. The first effect of immersion in cold water is to cause a certain shock to the system, accompanied by depression and a sensation of cold. The powers of the system to resist these depressing effects are called into play, and continue to act for a longer or shorter time, during which the sensations are generally of a pleasant kind, and excitement rather than depression is felt. These powers of reaction are, however, ultimately exhausted, and depression follows; and it should be the object of the bather to leave the bath before the power of reaction has been exhausted. When this will be, depends upon the degree of cold, and upon the constitution. The bather should leave the water whilst it continues to feel pleasant. No time should be lost in drying the body and dressing, after which a sharp walk may be taken with

advantage. Those to whom the tonic effect of the bath is not of so much importance as the specific action of the sulphur, will generally reap greater benefit from the tepid or hot bath; those who cannot take ordinary cold baths will be unlikely to bear the cold sulphur baths any better. Before breakfast is the most suitable for the tolerably strong, next to which an hour before the mid-day meal will be found the best time of the day. Bathing the throat and chest with cold water is perhaps the best preventative against catching cold in those parts. A cold shower bath, whilst standing in warm water, will be found suitable to many who cannot take an ordinary cold bath.

It may be useful if I give here the temperature of baths, in order that the various terms may be definitely understood:—

| Bath.                 | Water.        |
|-----------------------|---------------|
| The Cold . . . . .    | 33° to 65° F. |
| „ Cool . . . . .      | 65 to 75      |
| „ Temperate . . . . . | 75 to 85      |
| „ Tepid . . . . .     | 85 to 92      |
| „ Warm . . . . .      | 92 to 98      |
| „ Hot . . . . .       | 98 to 112     |

The temperate or tepid baths will be found most suitable for skin diseases, where it is wished to get the full benefit of the direct action of the sulphur upon the skin, and a person otherwise healthy may often remain in the water for half an hour or even more.

For the removal of rheumatic affections the warm and hot baths are decidedly the most suitable, but the higher temperature of the hot bath should never be employed except under special direction.

The first warm bath should be taken with caution, ten minutes or a quarter of an hour being the full time for remaining in the water. If this is not attended to, alarming symptoms, sudden in their appearance, are apt to be the result. If the first bath has been unattended by any disagreeable sensations, the time may be extended to twenty or twenty-five minutes. The unpleasant

symptoms which may be expected from too hot a bath or too prolonged immersion are—a sensation of fulness of the head, giddiness, and a feeling of weakness or palpitation. Contrary to the cold bath, the bather should enter the warm bath gradually; should not exercise much in it; and on leaving should take time in dressing. A sheet should be thrown round the body, over which a blanket may be placed, and a few minutes whilst thus attired spent upon the couch; at the end of which time the skin will be nearly dry, and dressing may be proceeded with slowly. The exercise afterwards should be gentle, or if the bath has been a hot one it is better to return home and rest for a short time.

The best time of day for these baths is the morning in summer time; in the afternoon if the time of year is spring or autumn; and in winter during the forenoon; but they may be taken at any hour of the day, if proximity to a meal be avoided. Three baths during the week is generally found sufficient.

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## RECREATION.

No health resort is worthy of being called such where there are not at least some facilities for recreation, and in this respect Moffat is well entitled to the name. The surrounding mountains afford unlimited scope for the energies of the robust pedestrian, and in the view they command from their summits furnish a reward for those who expend time and labour upon their ascent. For the less energetic, there are the lower hills and excellent roads, including the beautiful woods of the Gallow Hill, with its moss-carpeted avenues.

The requisites for driving are all supplied, there being no less than five establishments from which conveyances may be had at no exorbitant charge, varying in capacity from the four-in-hand coach to the modest pony carriage. Invalid chairs and riding ponies can also be hired.

Fishing is one of the attractions of the spot, and at no great distance are waters famous in piscatorial annals. The public bowling, lawn tennis, and croquet greens are perhaps unequalled in Scotland. A cricket club has been formed, and is a decided success. The plans have been prepared for the formation of a large artificial lake, for the purposes of boating in summer, and of skating and curling during the winter months. And yet, with all these attractions, Moffat is, and always will be, a charmingly secluded spot, shut off from all the bustle of the world, and one where quietness enough for a hermit may be obtained if desired. It is not within the purpose of this book to enter into an account of the various surrounding attractions, historical or otherwise. All this is ably treated of in the local guide books, notable among which is Black's, which has been brought up to the most recent date. I shall merely add a few words of advice, which may be of benefit to some.

In driving among the hills, even in the warmest weather, a few warm wraps should always be taken. If not required, no harm has been done, and often the slight extra trouble will be well rewarded.

In rambling, it is well to be careful about quenching thirst with the nearest water, which, however tempting in appearance, may nevertheless contain injurious organic matter, or even, from its very refreshing coolness, may be injurious on this account if partaken of too freely. There is nothing so refreshing and sustaining on a pedestrian expedition as a little cold tea; no wine or spirits can equal it. It should be remembered that bathing in fresh water is not so generally suitable as that in the sea is, and that never should the bather remain in longer than a few minutes, particularly as the water of the mountain burns is exceedingly cold, even in warm weather.



## GEOLOGY OF MOFFAT.

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O give a short sketch of the Geology of Moffat is not very easy, involving, as it does, several formations out of which so many questions arise, most of which would require more space than I can give to the whole. It is usual in geology to begin at the lower formations, but I think in this case, the purpose will be better served by beginning at the surface, and speaking of the newer rocks first. The district is hilly, the hills belonging to a series that strike across Scotland and form the great southern uplands.

The town stands in the middle of three valleys—the rivers that flow through them meeting a short distance below the town; they are the Moffat, the Annan, and the Evan. The first and third of these valleys are narrow and rocky, cut out of the hard Silurian rocks that form the hills, and in many respects resemble some of the Highland valleys up which the sea flows and forms the sea lochs. The Annan valley, which lies between, and in which Moffat stands, is of a very different description; it is much wider, and lies beautifully open to the south. It is cut out of a soft red sandstone which overlies the Silurian.

The whole of this appears at one time to have been filled with water, and has been a large loch, the outlet of which has been at a farm called Poldean, some three or four miles below the town. This loch was most likely a relic of the great glacial period, of which so many evidences exist all over the country. All lochs (or lakes) have a tendency to commit suicide; are indeed always at

it—that is, all the waters that flow into them and form their feeders, carry sand, gravel, mud, and other *debris* in, and fill them up; and the stream that flows out must always be cutting its channel deeper, thereby lowering the surface. So, between these two causes, they get obliterated. That the first cause has been at work in our old lake basin is shown by several large mounds of sand and gravel, that still occupy part of the valley below the town; and, indeed, the whole site of the town is part of the old gravel bed that once filled the lake. I have never seen it cut through to the solid rock below, nor do I know its thickness at this particular part, but at one time it must have been much thicker, as immense quantities must have been carried down the river by floods when the river had freedom to wander all over the valley, as it once did. But in order to allow this mass of gravel to be carried away, the outlet must have been deepened and widened. This is seen to be the case where, what once was the outlet to the lake, is now a wide gap, through which the river Annan flows. From this deep stratum of river, gravel, and sand all over the valley, Moffat is particularly well drained; no sooner does rain fall than it rapidly sinks through the gravel, and is carried away by the rapid running streams.

The lake, as I have said, was a relic of the great glacial period, when the whole northern part of this country was covered with ice. The principal evidence of its existence is what is generally termed “tile, or boulder clay,” which used to be the despair of the older geologists. At first it was thought to have been deposited by great floods of water; but it was soon found that it could not be accounted for in this way, consisting, as it did, of a tough, tenacious clay, full of angular fragments of rock, and these generally covered by scratches. It was like no water product, and could only have been produced by some agent that could grind the stones one upon the other, such as ice. At first some thought it might have been caused by floating ice, when the land was sunk fathoms deep under the ocean; latterly it has been found

that nothing but a huge ice cap, like that which now covers Greenland, will account for it. In this neighbourhood local evidences of ice are very abundant, particularly in the upper valley of the Talla, and about Loch Skene, where there are numerous mounds of glacial *debris* and morain matter; and, as I said before, the site of the town is an old glacial lake basin, but the action of the ice has been more to grind down the hills and scoop out the valleys than to lay down a deposit; and when we get fragments of an equivalent deposit to the boulder clay, as we sometimes do on the sides of the valley, it is found to be somewhat different from the usual boulder clay. The clay is represented by sand, composed of the ground-down fragments of the underlying red rocks. The angular fragments of the harder rocks are all there, but the scratches are, for the most part, found to be weathered off. This is caused by the water having such a free passage through the loose and porous sand. Although the glacial period is thus meagrely represented by the boulder clay, yet its peculiar ice phenomenon is both instructive and interesting, and it is rendered more so by a study of the sandstone which lies below and forms the floor of the valley.

This red sandstone belongs to the Permian formation, and must at one time have filled the whole of the valley, for I have got fragments as far up the valley of Moffat as Birk Hill, which is just on the watershed. There is a good section of it in the Beld Craig Lynn, a small valley near Moffat Water—in fact the place owes much of its picturesque beauty to its being cut out of the red sandstone rock by the burn running through it. The sandstone, while it is of a nature capable of being (or admitting of its being) easily cut out by running water, is, at the same time, able to resist atmospheric weathering. We get, in consequence, something like the American cañons, instead of a Scotch glen—that is, the burn has cut through the stone a deep narrow gorge, which has high, wooded banks, and steep, rocky sides. The Permian sandstone stretches from the top of the valley of Annan, and round Moffat, through

Dumfriesshire into Cumberland. It is too soft for a building stone, but lower down the country it is largely quarried, and brought to Moffat for building along with the blue rocks from the hills.

The only fossils found in this sandstone are the footprints of reptiles, which are got in a quarry named Corncockle, near Dumfries. These footprints, for the most part, belong to an apparently huge, frog-like reptile, which, in all likelihood, sought its living along the sea shore, or, more probably, the shores of great fresh-water lakes. At all events, the footprints have been made in the sand when it was in a soft, wet state, and were evidently covered up and preserved. Though this is the only evidence of life left in our locality, these same Permian rocks are not everywhere so barren, but yield evidence of abundance of life in that old world. I have often thought what a very different scene one could then have looked upon from these old hillsides, when the huge reptile waddled its slow way across the wet sand. The same hills were then as now, though they must have been much higher, and the vegetation, and living things which moved about, must have been very different. Were there any birds warbling about amongst the tall, reed-like plants which grew by the lake sides? Very different indeed must have been the scene from that which we now see. The Permian is the formation that comes immediately above the carboniferous, so we find this sandstone of the Annan valley overlying the Canobie coal fields. These same coal, and their associated beds, seem at one time to have filled the valleys that the Permian sandstone now occupies, but to have been denuded or washed out of them; and when we examine the Permian rocks, it seems as if ice then, as now, had been the most active agent. As I said of the boulder clay, the numerous stones found in it, instead of being round and water-worn, are mostly angular fragments, and generally covered with scratches from being rubbed against each other when embedded in the ice, as it slid slowly down the hill. Most of these Permian beds are conglomerate. The fragments of rock

embedded in the sandy matrix are not round, but angular, and bear a great resemblance to those found in the boulder clay, and though none of the peculiar scratchings have been found on them, they have been found in other localities, and their absence is accounted for by the porous nature of the sandstone, as the water that passes freely through that rock gives great facilities for the weathering of the contained fragments. These Permian rocks about Moffat look very like as if they were made up of glacial *debris*.

The glacial period used to be the greatest puzzle and the least interesting to geologists, but through the researches of Mr Croall we seem to have got a slight clue to fixing its age. Should he succeed in doing this, and be able to trace an ice period in all the formations as we can in the Permian, who knows but we may be able to answer the question so frequently put to geologists, How old are these rocks? If we were able to do this by a long string of figures, it would tend to satisfy them (the questioners), though it would give them very little more information than they at present get from the name of a geological period.

Although the Permian rocks about Moffat are quite void of fossils, yet, from what I have said, it will be seen that they are of considerable interest to geologists, and they add much to the salubrity of the town; for though the rainfall is considerable, muddy and wet streets are never seen, as the water gets so easily through the loose gravel and porous sandstone.

Shutting in the town on every side but the south, we have the old Silurian hills, mostly made up of a dark blue grey rock, which is the building stone principally used in the district, and this dark sombre-looking stone, when used for villas and houses, with windows and doors framed with the bright red sandstone, has a very pretty effect. These hills are of considerable height, two of them, Hartfell and Whitcoomb, rising nearly three thousand feet above the sea level, but they are now mere remnants and worn-down stumps. They have been a range

of hills before the carboniferous period, and the rivers that now flow down their valleys are but clearing out the old water courses through which rivers ran, when the trees that now form our coal fields were green in the forest. So they are venerable as hills, and they were old and much denuded before the rocks that form the Alps were laid down as strata. When we pass from the red rocks to the hills, there is no difficulty in seeing that we are passing from newer to older rocks, for the Permian lies nearly flat, and very little moved from the position in which it was laid down as strata. But the Silurian rocks have all been tilted up on edge, and when we examine it closely, we find in some cases they have been turned back, bringing beds over the top of others, under which they formerly lay. As before said, the rocks are generally of a very hard nature, but at various intervals there are brought to the surface some black beds of a soft slaty nature; these can be traced over a considerable distance, and as they contain fossils, are of great interest to geologists. This neighbourhood is somewhat famous for these; they are found in several well-known localities, such as Hartfell, in a small glen on the flank of that hill, and also known as a source of mineral water; Dobb's Linn, at the top of Moffat Water, which is probably the best; Garpool Glen; in Evan Waters; Duff Kennell, and several others. And one may almost be sure, wherever these black beds crop up, to find the characteristic fossils and mineral water. The water from these black beds is highly impregnated with alum and iron, differing considerably from the one usually called Moffat Well. It also comes from the old Silurian, but also from the hard blue rocks of which the town is built.

The fossils found in the Moffat Silurian consist mostly of what are called by geologists, graptolites and their allies—with three or four species of crustacea and shell, but these latter are rare, whereas the former are very abundant. These graptolites are of many genera and species. They belong to a low class in the animal world, called compound animals. Their nearest allies at the

present day are very minute, branching, and plant-like animals, that occur in deep-sea dredging; though these recent forms in some respects resemble graptolites, they are a good deal removed from them, for this large family of animals seem to have died out at the close of the Silurian period—their remains are not found above that. Their appearance, as they occur in the Moffat shales, have a considerable resemblance in many cases to rude writing, and at first they were thought to be plants, which at first sight they closely resemble, and indeed their allies of the present day are always taken for sea weeds by those not naturalists. The tracing out of their affinities has been a long and tedious process with geologists, so many links having been lost between them and the present living class coming nearest them. They are now pretty well understood, and they seem to have belonged to a class of animals nearly as low as the sponge. They are very characteristic of the Silurian, as they do not occur above that formation, and they add a considerable scientific interest to the neighbourhood.

### OBJECTS OF INTEREST IN AND NEAR MOFFAT.

MOFFAT WELL, about  $1\frac{1}{4}$  miles. Open daily, from morning till night, and on Sundays from 7 to 9 A.M. and 5 to 7 P.M.

THE BATHS—Vapour, mineral, and common. Billiard-room, and Bowling Green.

GALLOW HILL—Fine view of surrounding country.

CROQUET GROUND and BOWLING GREEN in the Beechgrove. Admission by subscription.

DEVIL'S BEEF TUB,  $5\frac{1}{2}$  miles, on the new Edinburgh road.

LOCH HOUSE TOWER, between Beattock and Moffat; fine echo.

GARPEL GLEN, 4 miles, taking in Auchencas Castle and remains of Roman Camp and ancient Fort. (No admission on Sundays.)

RAEHILLS GLEN, 8 miles, on Dumfries road, and LOCHWOOD TOWER, with its fine wood and grand old oaks.

BELD CRAIG, 4 miles, on old Carlisle road, past Dumcrieff House, seat of Lord Rollo.

HARTFELL SPA, 4 miles, on old Edinburgh road.

WAMPHRAY GLEN, 7 miles.

ST MARY'S LOCH, 15 miles—taking in Craigieburn Wood, Dobb's Linn, Bodesbeck, and the celebrated Grey Mare's Tail.

QUEENSBERRY, 8 miles. Extensive view.

FISHING, during the season, open to all:—The Annan, the Evan Water, Moffat Water, the Well Burn, Granton Burn, Hartfell Burn, Lochan Burn, Garpel Burn, Cloffin Burn, Cornal Burn, Blackshope Burn, Selcoth Burn, Corriefron Burn, the Tail Burn. Also, at medium distances, the Dryfe (8 miles), the Clyde, the Ettrick (8 miles), the Fruid (8 miles), the Kinnel (4 miles), Wamphray Water. Also, Loch Skene ( $11\frac{1}{2}$  miles), the Loch o' the Lowes (14 miles), St Mary's Loch, the Megget, and the Yarrow.

## RAILWAY COMMUNICATION

WITH BEATTOCK STATION (Caledonian).

|                     |                        |
|---------------------|------------------------|
| From London, ... .. | 8 $\frac{1}{4}$ hours. |
| “ Manchester,... .. | 4 $\frac{3}{4}$ ”      |
| “ Liverpool, ... .. | 4 $\frac{1}{2}$ ”      |
| “ Carlisle, ... ..  | 1 ”                    |
| “ Glasgow, ... ..   | 2 ”                    |
| “ Edinburgh, ... .. | 1 $\frac{3}{4}$ ”      |

Omnibuses leave Moffat for Beattock Station every week day at 7.30, 9.0, 10.10, 11.55 A.M.; 2.15, 3.30, 4.30, 5.50, 7.30 P.M. On Fridays a 'Bus leaves at 1.45 P.M.

## POSTAL AND TELEGRAPH ARRANGEMENTS.

## P O S T A L.

The Post Office is in the High Street.

Post Mistress, Miss Black; Assistant, Miss Grieve.

Letters, &c., are *despatched* as under :—

|  | Without<br>extra<br>charge<br>until | With<br>extra<br>charge<br>until | Letters,<br>&c., can be<br>registered<br>until | Letters,<br>&c., can be<br>registered<br>with an<br>extra fee<br>of 2d<br>until |
|--|-------------------------------------|----------------------------------|--|---|
| All parts.....                               | 3.10 P.M.                           | 3.20 P.M.                        | 3 P.M.   | 3.10 P.M.   |
| London and the<br>South.....                 | 6.35 P.M.                           | 6.45 P.M.                        | 6.20 P.M.                                      | 6.35 P.M.   |
| Edinburgh,<br>Glasgow, and<br>the North..... | 7 P.M.                              | 7.10 P.M.                        | 6.50 P.M.                                      | 7 P.M.  |
| All parts.....                               | 10 P.M.                             |                                  |  |   |

Letters despatched on Sundays at 6.35 P.M. for the South, and at 10 P.M. for the North and South.

Letters, &c., are *delivered* in Moffat as under :—

|  | Delivery by<br>letter car-<br>riers begins<br>at | Delivery to<br>callers be-<br>gins at |
|--|--|---------------------------------------|
| All parts.....                                       | 7 A.M.   | 7 A.M.                                |
| Edinburgh, Glasgow, and the<br>South .....           | 5.10 P.M.  | 5.10 P.M.                             |
| Edinburgh, Glasgow, the North,<br>and Carlisle ..... | 9 P.M.   | 9 P.M.                                |

There is no delivery by letter carriers on *Sundays*, but there is a *delivery to callers* at the window on *Sundays*, from 8 A.M. till 10 A.M.

*Telegraph Office* open every week day, from 7 A.M. till 9 P.M.; and on *Sundays*, from 8 A.M. till 10 A.M.

## CHURCH SERVICES.

ESTABLISHED CHURCH OF SCOTLAND :—

Minister—Rev. J. G. Macvicar, D.D., LL.D.

Morning, ... .. at 11.15

Afternoon, ... .. at 2.15

FREE CHURCH :—

Rev. R. Kinnear.

Rev. Kenneth Moody-Stuart, M.A.

Morning, ... .. at 11.15

Evening, .. .. at 6.15

## UNITED PRESBYTERIAN CHURCH:—

Rev. A. R. MacEwen, M.A., Oxon., B.D.

Morning, .. .. at 11.15

Evening, ... .. at 6.15

## EPISCOPAL CHURCH:—

Morning, ... .. at 11

Evening, ... .. at 6.30

Holy Communion first and third Sundays of month.

## WEEKLY MEETINGS:—

Weekly Prayer Meeting in Free Church on Wednesdays, at 7.30 P.M.

Weekly Prayer Meeting in U.P. Church on Wednesdays, at 7.30 P.M.

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Medical Practitioners.

James Munro, M.D., L.R.C.S., Vicarlands (opposite the Buccleuch Hotel).

R. Thomson Forbes, M.B., C.M., Hydropathic Establishment. Consulting Rooms—18 Well Street.

W. D'Oyly Grange, M.D., C.M., Mansfield House (adjoining the English Church).

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Chemists.

T. Hetherington, High Street.

J. H. Black (from the Glasgow Apothecaries' Co.), Well Street.

**House Agents.**

Robert Knight, Bookseller, 16 Well Street.

R. Robertson, Bookseller, High Street.

John Coupland, Hairdresser, Well Street.

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**Hotels.**

|                 |     |     |               |
|-----------------|-----|-----|---------------|
| Annandale Arms, | ... | ... | R. Norris.    |
| Buccleuch Arms, | ... | ... | H. Cranstoun. |
| Star Hotel,     | ... | ... | A. Stark.     |

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**The Moffat Hydropathic Establishment.**

|             |     |     |         |
|-------------|-----|-----|---------|
| Manager,... | ... | ... | C. Nau. |
|-------------|-----|-----|---------|